DOCUMENT RESUME

ED 373 489 EC 303 258

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TITLE Research Priorities of the National Institute on Deafness and Other Communication Disorders.
PUB DATE May 92
NOTE 5p.; In: Cherow, Evelyn, Ed. Proceedings of the ASHA Audiology Superconference. ASHA Reports Number 21, p5-8, May 1992.
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Audiology; Awards; *Communication Disorders; *Deafness; *Federal Aid; Government Role; Grants; Research Needs; *Research Projects; Resource Allocation; Workshops
IDENTIFIERS *National Institute Deafness Other Commun Disorders

ABSTRACT

This paper summarizes research efforts of the National Institute on Deafness and Other Communication Disorders (NIDCD) and identifies research priorities. The NIDCD is responsible for research and research training related to both normal and disordered hearing, balance, smell, taste, voice, speech, and language. The paper notes that 59 percent of the Institute's current portfolio is research in the area of hearing, 7 percent in voice, 8 percent in speech, and 9 percent in language. Also noted is the Institute's establishment of National Multipurpose Research and Training Centers, the Institute's increasing efforts to improve data on the incidence and prevalence of communication disorders, and the Institute's special emphasis on minority-related research and minority scientists. Specific priority areas addressed or planned for fiscal years 1990, 1991, and 1992 are listed under the following categories: (1) requests for applications, (2) requests for proposals, (3) program announcements, and (4) workshops and conferences. Mechanisms for awarding research grants are outlined. (DB)

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Chapter 2

RESEARCH PRIORITIES OF THE NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS

JAMES B. SNOW, JR.

National Institute on Deafness and Other Communication Disorders

Thank you, Evelyn Cherow and Jo Williams, program coordinators, for including the National Institute on Deafness and Other Communication Disorders (NIDCD) in the ASHA Audiology Superconference. Your excellent conference program shows clearly that ASHA and the NIDCD share many similar, current interests and concerns.

The NIDCD is responsible for research and research training related to both normal and disordered hearing, balance, smell, taste, voice, speech, and language and is one of the 13 institutes of the National Institutes of Health in Bethesda, Maryland. To plan ahead amid rapidly emerging science in the Institute's program areas, the NIDCD engages in regular updating of the National Strategic Research Plan (NSRP) that was developed in 1989. This year two expert panels have updated the sections on the vestibular system and language. In 1992 hearing and voice will be updated, and in 1993 speech and the chemical senses will be updated. By repeating this cycle every 3 years, no part of the NSRP will be more than 3 years old.

The NIDCD responds to its mission by fostering critically needed basic research to improve the understanding of human communication while supporting research protocols for prevention, therapeutic intervention, and development of devices that will improve the quality of life for those who have communication disorders.

The NIDCD accomplishes its mandate through research performed in its own laboratories, a program of research grants, career development awards, individual and institutional research training awards, center grants, and contracts to public and private research institutions and organizations. The Institute also conducts and supports research and research training in disease prevention and health promotion. The NIDCD is concerned with the special biomedical and behavioral problems associated with people having communication impairments and disorders.

The Institute is also supporting efforts to create devices that will substitute for lost and impaired communication functions—devices that include cochlear implants, hearing aids, and vibrotactile aids. The NIDCD has made major investments in the development and improvement of multichannel cochlear implants, including a new interleaved-pulse speech processor capable of sampling speech at high rates. This processor provides impressive gains in understanding speech. The study of digital hearing aids is being pursued with great intensity. Fifteen grants are currently focused on various aspects of hearing aids.

The NIDCD is pleased to have again received an unprecedented commitment of the nation's financial resources to support research and research training in hearing, balance, smell, taste, voice, speech, and language. The Institute's budget for FY 1990 was $117,283,000 and has increased 15% to $134,935,000 for FY 1991 (Table 1). The President's budget for the Institute for FY 1992 is $146,321,000, an 8.44% increase compared to an increase of 6% for all of the NIH. The vast majority of these dollars will go toward supporting investigator-initiated research projects.

In FY 1989, the NIDCD was able to fund 97 new and competing renewal grants, 130 in FY 1990 and an estimated 138 in FY 1991 (Table 2). At the level of the President's budget for 1992, 118 new and competing renewal grants can be funded. The scientific community has responded to the creation of this Institute by providing an increasing number of high-quality applications: 254 in FY 1989, 349 in FY 1990, and 472 in FY 1991. It is estimated that 542 applications will be received in FY 1992. The Institute success rate is declining and will approach the NIH average, which was 24% for FY 1990.

Fifty-nine percent of our current portfolio is research in the program area of hearing and approximately one third of our total portfolio is in neurobiology, including investigations related to neural regeneration, auditory perception, and voice and language disorders. With this substantial interest in the neural bases of disorders such as aphasia, the Institute is pleased to be part of the NIH community of Institutes that are involved in The Decade of the Brain.

One in 1,000 infants is born deaf. Approximately 2 million people in the United States are profoundly deaf. From 40 to 60% of profound neonatal deafness can be attributed to genetic causes. Research in molecular biology and specifically molecular genetics holds great promise for the use of gene therapy in hereditary deafness and other disorders of human communication that are clearly hereditary. The NIDCD has made important progress on two forms of

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TABLE 1. National Institute on Deafness and Other Communication Disorders budget (in thousands of dollars).

Areas funded	*FY 1990 actual*	*FY 1991 appropriation*	*FY 1992 estimate*
Research			
Research projects	$86,419	$94,178	$103,577
Research centers	12,001	17,562	18,006
Other research			
Careers	2,295	3,053	3,053
MBRS	240	316	333
Other	905	825	825
Total	101,860	115,934	125,794
Training			
Individual	571	968	987
Institutional	2,548	3,017	3,047
R&D contracts	2,143	2,930	3,027
Intramural	5,159	6,117	6,590
RM&S	5,002	5,969	6,876
Grand total	$117,283	$134,935	$146,321

hereditary deafness, Usher's syndrome and Waardenburg's syndrome. NIDCD investigators have recently narrowed the search for the Usher type II gene to a region on chromosome 1 and plan to fine-map, clone, and characterize the gene. A team of scientists in the NIDCD Intramural Research Program and a network of clinicians are at work studying Waardenburg's syndrome. Geneticists, otolaryngologists, and audiologists throughout the country have been enlisted to provide contacts between intramural scientists and families with hearing loss due to Waardenburg's syndrome who would like to participate in the research. Initially, the focus will be on the mapping of the gene involved in Waardenburg's syndrome. This information can subsequently be used to improve diagnosis and genetic counseling and eventually may lead to gene therapy for syndromes of hereditary deafness.

We are involved in important research in the areas of balance, smell, and taste. Although only 2% of our current portfolio is in balance-related research, this is a growing area within the Institute. NIDCD is supporting balance-related research on the micromechanical properties of the vestibular hair cells that may explain how these cells detect forces acting upon them during movement of the head and changes in gravity and transform this information into neural signals. We are currently in discussion with NASA about a cooperation between NASA and NIDCD-supported scientists.

In other basic science research, investigators studying the sense of smell have found an indication that some forms of Parkinson's disease and Alzheimer's disease may be caused by environmental agents that enter the brain through the olfactory nerve. Studies in the chemical senses represent 15% of our grant support.

The balance of our investigator-initiated research portfolio is in the program areas of voice, speech, and language. Voice research is 7% of the portfolio, speech 8%, and language 9%. Some recent findings from these areas result from work on long-term delay in speaking, research on the treatment of voice disorders, research on stuttering, and research on language acquisition.

In addition to the ongoing intramural and extramural research studies with which you are familiar, the Institute provides national leadership in the development and recruitment of investigators and a national focus in the search for good research ideas.

The first three National Multipurpose Research and Training Centers have been established. These centers will stimulate important areas of basic and clinical research while providing needed research training opportunities. They will increase the numbers and broaden the capabilities of investigators in the communication sciences. The one at Boys Town in Omaha under the leadership of Patrick Brookhouser addresses hearing loss in children. The one at Johns Hopkins is on basic and applied studies of the auditory and vestibular systems under the direction of Murray Sachs. The one at University of Iowa is on voice and speech disorders under the guidance of Ingo Titze. Continuing education for health professionals will be provided, and these programs will disseminate research results to physicians, other health professionals, and the public. The NIDCD Clearinghouse will be coordinating with these centers to increase dissemination of information.

The Institute's National Strategic Research Plan has identified that there is insufficient incidence and prevalence data on communication disorders. After holding planning meetings with the National Center for Health Statistics (NCHS), the NIDCD is preparing a 10- to 15-year epidemiologic research strategy. This strategy in collaboration with the NCHS will yield incidence and prevalence data in the Institute's seven program areas and will provide reliable and cost-effective data in a systematic and comprehensive manner over the life span. The NIDCD is establishing an epidemiology branch to coordinate these efforts. A current NIDCD initiative is for contracts to be awarded on the epidemiology of specific language impairment in children.

In another effort to supply needed information to the field, the NIDCD held in September of 1990 the first of a series of working group meetings designed to look at the needs of the several constituencies served by the Institute. Each working group has an opportunity to inform the Institute of their special research and research training needs. The first working group provided perspectives of the deaf community and was held September 7, 1990; the second will provide the perspectives of oral, auditory hearing-impaired persons and will be held April 23, 1991; the third will address the research and research training needs of

TABLE 2. National Institute on Deafness and Other Communication Disorders competing research project grants.

	FY 1989 obligations	*FY 1990 obligations*	*FY 1991 estimate*
Number of grants	97	130	138
Amount	$16,973,000	$22,476,000	$25,557,000

women and women's health issues on October 3, 1991; the fourth will present the needs of minority persons and minority health issues on April 28, 1992; and the fifth meeting in this series will assess the impact of visual impairment on deaf and hard of hearing persons on September 29, 1992. Each of these groups will be making a report to the Institute that will help the staff in planning for the future.

NIDCD will continue the support of minority-related research and minority scientists. In several of its clinical trials on otitis media, specific attention has been devoted to minority populations such as American Indians and native Alaskans. Although all clinical trials supported by NIDCD include both male and female subjects, recent findings in diseases affecting women differentially have occurred in Meniere's disease, otosclerosis, and voice tremor. The scientific community has become increasingly alert to the unique needs of each of these groups, and the NIDCD is committed to continued attention to the needs of these populations.

The NIDCD employs several different mechanisms to nurture applications in areas of science that are either not receiving enough attention or are particularly promising as links to entire arenas of discovery. Last year (FY 1990) the NIDCD Implementation Plan included requests for applications, requests for proposals, program announcements, workshops and conferences. Research topics for each category included the following:

Requests for Applications

- Recognition and treatment of perilymphatic fistulae
- Development of a vaccine for the prevention of otitis media
- National multipurpose research and training centers
- Multipurpose research and training: Initial development centers

Requests for Proposals

- Reimplantation/explantation of cochlear implants in adult monkeys
- Design and evaluation of pediatric cochlear implants
- National human temporal bone information center
- Epidemiology of specific language impairment
- National information clearinghouse

Program Announcements

- Language learning in children who are deaf
- Treatment efficacy of voice disorders
- Neurobiology of taste pathways
- Genetics: Chemical senses
- Small grants: Communication disorders

Workshops and Conferences

- Clinical assessment of speech and voice disorders
- Balance and vestibular disorders
- Epidemiology/population-based studies
- NIDCD research and training: Perspectives of the deaf community

This year (FY 1991) we are engaged in the development of new initiatives including the following:

Requests for Applications

- Immunologic basis of sensorineural hearing loss
- Neural imaging of CNS processing of speech and language
- Treatment of adult aphasia: Protocols and efficacy
- Nasal chemosensory nerves as portals to the brain
- NIH/NASA vestibular studies

Requests for Proposals

- Protective effects on the deafened auditory nervous system of patterned electrical stimulation
- Development of new diagnostic tests for taste disorders
- Assessment of dense array vibrotactile stimulator
- Establishment of data base on inherited hearing impairment

Program Announcements

- Epidemiology and development of a genetic library of hearing loss
- Development of a model system for early identification of hearing loss
- Mechanisms of voice disorders
- Literacy in deaf persons

Workshops

- Epidemiological studies
- Treatment of adult aphasia
- Hearing impairment and communication disorders in AIDS
- Evaluation of existing therapies for stuttering
- Growth and senescence of sensory receptors in smell and taste

Our implementation plan for next year (FY 92) includes:

Requests for Applications

- Hearing impairment and communication disorders in AIDS
- Predictive efficiency of intra-operative cranial nerve monitoring
- Small grants to facilitate use of new techniques of molecular and cell biology and genetics by resources in deafness and other communication disorders
- Population normative database for vestibulo-ocular tests across the life span
- Treatment efficacy in stuttering: Evaluation of new and existing therapies

Requests for Proposals

- Population studies of deafness and hearing impairment
- Studies on cochlear implant—hearing aid users
- Development of improved percutaneous connectors
- Population database of balance and vestibular disorders

Program Announcements

- Molecular bases of repair/regeneration of the auditory receptor
- Mechanics of the vestibular labyrinth
- Identification of childhood language impairment in multicultural populations
- Use of the x-ray microbeam facility for research in speech production
- Assessment of speech and voice production: Research and clinical applications
- Chemosensory disorders and altered nutrient intake

Workshops and Conferences

- Planning and writing successful grant applications: A workshop for clinicians
- Early identification of hearing disorders in children
- Development of an evoked response test of the vestibular system
- Augmentative communication for the speech impaired: Research needs and directions
- Neural mechanisms of spoken and signed language
- Integration of taste, smell, and touch by the central nervous system
- Speech production in the prelingually deaf child
- Development of tests of the chemical senses

Research grants make up the largest category of support by the NIDCD. These grants may be awarded to universities, medical and other health professional schools, colleges, hospitals, research institutes, for-profit organizations and government institutions that sponsor and conduct biomedical research and development. Research grants may provide funds for salaries, equipment, supplies, travel, and other allowable direct costs to the sponsoring institution or organization. I shall highlight here a few of the mechanisms that may be of special interest to you:

R03. The Small Grant Program provides support for pilot research or especially innovative/high-risk research to determine the feasibility of a subsequent research project. For example, the pilot research may involve development of tests of new techniques or a small basic, clinical, or epidemiological research project. This program is designed primarily to support investigators changing their areas of research, especially those coming into communication disorders research for the first time from another area, and clinicians with limited research experience. Participation in the program by investigators at minority institutions is encouraged.

K08. Clinical Investigator Development Award (CIDA). The purpose of this mechanism is to recruit and prepare clinically trained individuals for research and teaching careers in the areas of medical science related to communication sciences and disorders. By supporting individuals with an interest in academic research careers, this award bridges the gap between the initial period of postdoctoral study and a secure academic appointment, or completes the development of research capabilities of someone who may have had minimal research experience.

R29. The FIRST Award. The objective of the FIRST award is to provide, at a domestic institution, a sufficient period of research support for newly independent investigators to initiate their own research and demonstrate the merit of their own research ideas. These grants are intended to underwrite the first independent investigative efforts of an individual; to provide a reasonable opportunity to demonstrate creativity, productivity and further promise; and to help in the transition to traditional types of research project grants.

R01. The Research Project Grant. Investigator-initiated research grants make up the largest single category of support provided by both the NIDCD and the NIH as a whole. This is the most traditional grant activity. These grants are awarded to an organization on behalf of an individual principal investigator (P.I.) to facilitate pursuit of a research objective in the area of the investigator's research interests and competence.

The NIDCD is currently supporting research across the entire biomedical spectrum—from basic research to applied clinical trials and prevention and rehabilitation. I consider each component of the spectrum to be part of a critical chain of progress, each link contributing to our more complete knowledge of the processes of hearing, balance, smell, taste, voice, speech, and language.

Thank you for this opportunity to provide you with an overview of the work of the NIDCD, its mission, its budget, its programs and its initiatives. The NIDCD is answering the need to identify important areas for inquiry, encouraging promising scientists, and fostering research into the normal and disordered processes of human communication so critical to improving the quality of life for individuals who are born with or may acquire communication disorders.